Designing a knowledge base to support family practice certification examinations

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ABSTRACT

The American medical specialty boards certify physicians to practice medicine in their respective fields. In theory, a patient could consider board certification as an indication of at least minimal competence in an area of advanced training when selecting a physician. Minimal competence is not precisely defined.

The American Board of Family Practice (ABFP) currently administers paper-based certification and recertification examinations. These examinations contain conventional item formats, case descriptions, and still photographs. The examinations intend to engage and test problem solving skills, disease recognition, and fact retention.

The ABFP would like to enhance its testing process to 1) allow testing at remote sites and convenient times; 2) uniformly test important family practice activities, emphasizing management rather than the popular or exotic problems submitted by human item-writers; 3) adapt tests to examinee's responses or needs; and 4) create reasonable questions at the test site rather than centrally, to simplify administrative, economic, and especially security issues. Computer-based testing is potentially a means of achieving these goals. A self contained test generating program requires access to extensive amounts of information about family practice.

A knowledge base supporting certification tests would ideally store any information that the examiner might consider important in the practice of family medicine. The structure of the knowledge base should not limit the examiner's options, even if detailed data are not available to fill every record. The structure should permit graceful growth in complexity and volume of records. It should allow automated data acquisition tools to supply as much information as possible, and facilitate periodic modifications in structure and data. It should support various approaches to medical decision making and address the myriad concerns inherent in medicine. It should support both the creation of a plausible case and the evolution of that case in the event of multiple possible interventions by the examinee.

We constructed an Entity-Relationship diagram, with detailed attributes, to describe the activities and information pertinent to family physicians. Relationships between relationships describe probabilistic dependencies and the rationale for many interventions. This diagram suggests that the range of testable material surpasses the usual content of clinical record systems or diagnostic knowledge bases. A question may refer to health state recognition and therapy selection, medical rationale, financial and emotional costs to patients and providers, skills, and consequences of helpful and detrimental interventions. In addition, so as not to limit examiner's future options, the current design anticipates questions incorporating Bayesian reasoning, decision analysis from different perspectives, different cost perspectives, behavioral models, and ethical and expertise issues.

Fortunately, test generation does not require a comprehensive description of *all* facts used in family practice. However, it does require an organized collection of frequently used facts to generate questions or create simulations, and to critique examinee's inferences. This poster session will present detailed data structures intended to support a knowledge base that would administer ABFP examinations.